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**RESPONSE UNDER 37 C.F.R. § 1.116**  
**EXPEDITED PROCEDURE**  
**GROUP ART UNIT 2625**

Dkt. 2271/76516

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application of: Shigetaka SAKAKIBARA et al.

Application No.: 10/585,674

Group Art Unit: 2625

Filed: November 7, 2005

Examiner: Dung Tran

For: IMAGE PROCESSING METHOD, PRINTER DRIVER, IMAGING APPARATUS,  
IMAGE PROCESSING APPARATUS, AND IMAGING SYSTEM

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May 23, 2011

Date

Paul Teng  
Reg. No. 40,837

30 Rockefeller Plaza, 20<sup>th</sup> Floor  
New York, New York 10112  
Tel.: (212) 278-0400

Mail Stop AF  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**AMENDMENT UNDER 37 C.F.R. § 1.116**  
**IN RESPONSE TO FEBRUARY 23, 2011 FINAL OFFICE ACTION**

Sir:

This Amendment is submitted in response to the final Office Action dated February 23, 2011 in connection with the above-identified application.

Amendments to the Claims are reflected in the **Listing of Claims** beginning on page 2.

**Remarks** begin on page 9 of this paper.

**Listing of Claims**

The following listing of claims will replace all prior versions, and listings, of claims in the subject application:

1. (currently amended) An image processing method for performing an under color removal process and a black recording liquid incorporation process with respect to an input three-color signal, and generating image data for an image forming apparatus that is configured to form a color image on a recording medium using at least a cyan (C) recording liquid, a magenta (M) recording liquid, a yellow (Y) recording liquid, and a black recording liquid, the method comprising the steps of:

regulating a maximum black recording liquid incorporation amount whereby glossiness of black realized in an image formed on a glossy recording medium is not substantially degraded,

the maximum black recording liquid incorporation amount being a black recording liquid incorporation amount that does not cause a glossiness of a recorded portion to become lower than a glossiness of a recording medium when recording is made with a patch of  $(R, G, B) = (0, 0, 0)$  input at maximum grayscale; and

causing to be performed, by the image forming apparatus, an image forming process including forming black only with the black recording liquid until the maximum black recording liquid incorporation amount is reached and, when the maximum black recording liquid incorporation amount is reached, forming black with a combination of (i) a composite black using a mixture of the cyan recording liquid, the magenta recording liquid, and the yellow recording liquid and (ii) the black recording liquid [[color]] in a same amount as the maximum black recording liquid incorporation amount.

2. (original) The image processing method as claimed in claim 1, wherein  
the cyan recording liquid, the magenta recording liquid, the yellow recording liquid, and  
the black recording liquid contain pigment.

3. (original) The image processing method as claimed in claim 2, wherein  
the maximum black recording liquid incorporation amount is regulated in the black  
recording liquid incorporation process according to characteristics of the recording medium, and  
is arranged to be greater than 0% and less than 52%.

Claim 4 (canceled).

5. (original) The image processing method as claimed in claim 3, wherein  
an under color removal amount for the under color removal process is set to 100%.

6. (original) The image processing method as claimed in claim 3, wherein  
an under color removal amount for the under color removal process is set to 100% until  
the under color removal amount reaches the regulated maximum black recording liquid  
incorporation amount.

7. (currently amended) A printer driver stored in a non-transitory computer readable  
medium and embodying a program of instructions executable by a computer to perform an under  
color removal process and a black recording liquid incorporation process with respect to an input

three-color signal, and generate image data for an image forming apparatus that is configured to form a color image on a recording medium using at least a cyan recording liquid, a magenta recording liquid, a yellow recording liquid, and a black recording liquid, said printer driver being executed by the computer to perform the steps of:

regulating a maximum black recording liquid incorporation amount whereby glossiness of black realized in an image formed on a glossy recording medium is not substantially degraded,

the maximum black recording liquid incorporation amount being a black recording liquid incorporation amount that does not cause a glossiness of a recorded portion to become lower than a glossiness of a recording medium when recording is made with a patch of (R, G, B) = (0, 0, 0) input at maximum grayscale;

causing to be performed, by an image forming apparatus, an image forming process including forming black only with the black recording liquid until the maximum black recording liquid incorporation amount is reached and, when the maximum black recording liquid incorporation amount is reached, forming black with a combination of (i) a composite black using a mixture of the cyan recording liquid, the magenta recording liquid, and the yellow recording liquid and (ii) the black recording liquid [[color]] in a same amount as the maximum black recording liquid incorporation amount.

8. (currently amended) An image forming apparatus that is configured to perform an under color removal process and a black recording liquid incorporation process with respect to an input three-color signal, and form a color image on a recording medium using at least a cyan recording liquid, a magenta recording liquid, a yellow recording liquid, and a black recording liquid, the apparatus comprising:

a processing unit that is configured to (a) regulate a maximum black recording liquid incorporation amount whereby glossiness of black realized in an image formed on a glossy recording medium is not substantially degraded, the maximum black recording liquid incorporation amount being a black recording liquid incorporation amount that does not cause a glossiness of a recorded portion to become lower than a glossiness of a recording medium when recording is made with a patch of (R, G, B) = (0, 0, 0) input at maximum grayscale, and (b) cause to be performed, by the image forming apparatus, an image forming process including forming black only with the black recording liquid until the maximum black recording liquid incorporation amount is reached and, when the maximum black recording liquid incorporation amount is reached, forming black with a combination of (i) a composite black using a mixture of the cyan recording liquid, the magenta recording liquid, and the yellow recording liquid and (ii) the black recording liquid [[color]] in a same amount as the maximum black recording liquid incorporation amount.

9. (previously presented) The image forming apparatus as claimed in claim 8, wherein the cyan recording liquid, the magenta recording liquid, the yellow recording liquid, and the black recording liquid contain pigment.

10. (previously presented) The image forming apparatus as claimed in claim 9, wherein the maximum black recording liquid incorporation amount is regulated in the black recording liquid incorporation process according to characteristics of the recording medium, and is arranged to be greater than 0% and less than 52%.

Claim 11 (canceled).

12. (previously presented) The image forming apparatus as claimed in claim 10, wherein

an under color removal amount for the under color removal process is set to 100%.

13. (previously presented) The image forming apparatus as claimed in claim 10, wherein

an under color removal amount for the under color removal process is set to 100% until  
the under color removal amount reaches the regulated maximum black recording liquid  
incorporation amount.

14. (currently amended) An image processing apparatus that is configured to generate  
image data for an image forming apparatus that forms a color image on a recording medium  
using at least a cyan recording liquid, a magenta recording liquid, a yellow recording liquid, and  
a black recording liquid, the image processing apparatus comprising:

a printer driver stored in a non-transitory computer readable medium and embodying a  
program of instructions executable by the image processing apparatus to (a) perform an under  
color removal process and a black recording liquid incorporation process with respect to an input  
three-color signal, (b) regulate a maximum black recording liquid incorporation amount whereby  
glossiness of black realized in an image formed on a glossy recording medium is not  
substantially degraded, the maximum black recording liquid incorporation amount being a black  
recording liquid incorporation amount that does not cause a glossiness of a recorded portion to  
become lower than a glossiness of a recording medium when recording is made with a patch of  
 $(R, G, B) = (0, 0, 0)$  input at maximum grayscale, and (c) cause to be performed, by the image

forming apparatus, an image forming process including forming black only with the black recording liquid until the maximum black recording liquid incorporation amount is reached and, when the maximum black recording liquid incorporation amount is reached, forming black with a combination of (i) a composite black using a mixture of the cyan recording liquid, the magenta recording liquid, and the yellow recording liquid and (ii) the black recording liquid [[color]] in a same amount as the maximum black recording liquid incorporation amount.

15. (currently amended) An imaging system, comprising:

an image forming apparatus that is configured to form a color image on a recording medium using at least a cyan recording liquid, a magenta recording liquid, a yellow recording liquid, and a black recording liquid; and

an image processing apparatus that is configured to generate image data for the image forming apparatus, which image processing apparatus includes a printer driver that is configured to (a) perform an under color removal process and a black recording liquid incorporation process with respect to an input three-color signal, (b) regulate a maximum black recording liquid incorporation amount whereby glossiness of black realized in an image formed on a glossy recording medium is not substantially degraded, the maximum black recording liquid incorporation amount being a black recording liquid incorporation amount that does not cause a glossiness of a recorded portion to become lower than a glossiness of a recording medium when recording is made with a patch of  $(R, G, B) = (0, 0, 0)$  input at maximum grayscale, and (c) cause to be performed, by the image forming apparatus, an image forming process including forming black only with the black recording liquid until the maximum black recording liquid incorporation amount is reached and, when the maximum black recording liquid incorporation

amount is reached, forming black with a combination of (i) a composite black using a mixture of the cyan recording liquid, the magenta recording liquid, and the yellow recording liquid and (ii) the black recording liquid [[color]] in a same amount as the maximum black recording liquid incorporation amount.

REMARKS

Claims 1-3, 5-10 and 12-15 are pending, with claims 4 and 11 having previously been canceled without prejudice or disclaimer. By this Amendment, each of the independent claims 1, 7, 8, 14 and 15 has been amended to correct an informalities therein, without introducing new issues or new matter. Claims 1-3, 5-10 and 12-15 remain pending upon entry of this Amendment, with claims 1, 7, 8, 14 and 15 being in independent form.

Claims 1, 3, 5-8, 10 and 12-15 were rejected under 35 U.S.C. § 103(a) as purportedly unpatentable over Chang et al. (US 6,765,693) in view of Morisaki et al. (US 7,570,375) and further in view of Nami et al. (US 5,162,860). Claims 2 and 9 were rejected under 35 U.S.C. § 103(a) as purportedly unpatentable over Chang in view of Morisaki and Nami and further in view of Sugimoto et al. (US 6,274,282).

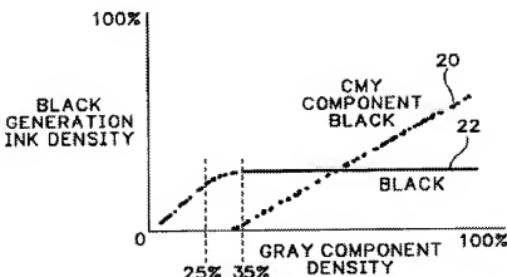
Applicant respectfully submits that the present application is allowable over the cited art, for at least the reason that the cited art does not disclose or suggest the aspects of the present application of causing to be performed, by the image forming apparatus, an image forming process including

- (a) forming black *ONLY with the black recording liquid until the maximum black recording liquid incorporation amount (regulated such that glossiness of black realized in an image formed on a glossy recording medium is not substantially degraded) is reached, and*
- (b) *when the maximum black recording liquid incorporation amount is reached, forming black with a combination of (i) a composite black using a mixture of the cyan (C) recording liquid, the magenta (M) recording liquid, and the yellow (Y) recording liquid and (ii) the black recording liquid in a same amount as the*

maximum black recording liquid incorporation amount.

In such aspects, a single threshold (that is, the maximum black recording liquid incorporation amount) is regulated such that glossiness of black realized in an image formed on a glossy recording medium is not substantially degraded (see, for example, Figs. 13-15 and corresponding discussion in paragraphs [0124]-[0127] of US 2009/0316236 A1), and is utilized to determine whether black is formed (a) with only black recording liquid, or (b) a combination of a composite black using a mixture of CMY recording liquids and black recording liquid, in the same amount.

Chang, as understood by applicant, proposes an approach for printing images using light black ink wherein black is generated using a combination of light black ink and composite black (from CMY inks), as shown in Fig. 2 (reproduced below) of Chang. As evident in Fig. 2 of Chang and as discussed in Chang, column 2 line 62 through column 3, line 17, composite black is used prior to the black ink amount reaching a constant level in the process of Chang.



**Figure 2**

More specifically, the process of Chang uses two threshold, wherein:

- (a) upto the first threshold, only black ink is used;
- (b) between the first threshold and the second threshold, a combination of black ink and composite black, while the amount of black ink remains below the maximum black recording liquid incorporation amount; and
- (c) at and above the second threshold, a combination of black ink and composite black, with the amount of black ink remaining constant at the maximum black recording liquid incorporation amount

Chang, as acknowledged in the Office Action, does NOT disclose or suggest forming black only with the black recording liquid until the maximum black recording liquid is reached.

However, it is contended in the Office Action, that one skilled in the art would have been motivated to modify the process of Chang to allow the consolidation of the two thresholds in Chang to a single threshold.

Such contention is traversed.

It is submitted that using two thresholds (as opposed to only one threshold) are integral to the principle of operation proposed in Chang. More specifically, the method for printing images using light black ink of Chang (see column 4, lines 23-34), is comprised of setting first and second thresholds which (were discussed in the discussion of Chang *supra* and) are determined in accordance with a relative relationship between an intensity value of a standard black ink and an intensity value of the light black ink, then determining a density value of a pixel density component, calculating a black generation value based on the first and second thresholds, and adjusting the other color values based on the calculated black generation value. Such approach, as pointed out in Chang, is directed to the problem of blurring of a print image with noticeable

black dots using pigment ink.

It is noted that such approach of Chang is premised on the existence of two thresholds with one of the two threshold being one above which the C,M,Y inks, in increasing amounts, will be mixed with the black ink, also in an increasing amount until the black ink amount reaches a threshold amount at the second threshold.

Modifying the method of Chang to replace the two thresholds with one threshold, as proposed in the Office Action, would change the principle of operation of Chang. Such modification changing the principle of operation of the reference, as pointed out in MPEP 2143.01.VI (reproduced below), cannot establish *prima facie* obviousness.

#### **VI. THE PROPOSED MODIFICATION CANNOT CHANGE THE PRINCIPLE OF OPERATION OF A REFERENCE**

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) ...

Further, it is noted that according to Chang, composite black (that is, black formed by combination of C,M,Y inks) is preferably used, and the thresholds in Chang are set in accordance with a relative relationship between an intensity value of a standard black ink and an intensity value of the light black ink.

However, Chang is silent as to regulating a maximum black recording liquid incorporation amount such that glossiness of black realized in an image formed on a glossy recording medium is not substantially degraded, wherein from a glossiness point of view, it is not preferable to use composite black at a low gray-scale value (that is, where the black recording liquid amount is below the maximum black recording liquid incorporation amount).

Morisaki, column 7, lines 20-32 (reproduced below), was cited in the Office Action:

In S21, the CPU 31 judges whether an image to be printed is a black-and-white image or a color image. If a color image is to be printed (S21: NO), control proceeds to S25, where the color image data is generated. If a black-and-white image is to be printed (S21: YES), it is judged whether the sheet is a glossy paper (S22). As aforementioned, if the black ink is used for the glossy paper, the ink does not dry quickly and deteriorates the image quality. Therefore, if the image is to be printed on the glossy paper (S22: YES), the print data for a color-mixing mode print is generated, that is, the print data is generated such that the cyan, yellow and magenta inks are used for forming the black-and-white image (S23).

Thus, Morisaki merely proposes that if the image is to be printed on the glossy paper, the print data is generated such that the cyan, yellow and magenta inks are used for forming the black-and-white image.

However, Morisaki, like Chang, is silent as to regulating a *maximum black recording liquid incorporation amount* such that glossiness of black realized in an image formed on a glossy recording medium is not substantially degraded

Further, Nami, column 10, lines 10-21, and 51-57, states as follows:

As a result of forming the full color image by using the above-described toners, the fixing devices and the image processing means, the tone image region A was formed by the cyan, magenta and yellow toners each having substantially the same softening point. Therefore, the glossiness of the region A was made to be uniform. On the other hand, the line image region B including characters was formed by four color toners including the black toner the softening point of which is higher than the color toners by 10°C. or more. In particular, *the glossiness of the black characters are reduced* so that the characters could be easily read.

...  
Since the image separation is arranged to be automatically discriminated, the labor of a user can be reduced. Furthermore, the tone image displayed uniform glossiness and the *glossiness of the black characters could be reduced* among the characters of the character/line image. *As a result, an image displaying excellent quality could be obtained.*

Thus, Nami proposes that reduction of glossiness is desirable in order to obtain improved

image quality and to enable characters to be easily read.

On the other hand, as mentioned above, a motivation of the aforementioned aspects of the present application is to AVOID decrease of glossiness. Stated another way, Nami actually leads one skilled in the art AWAY from the aforementioned aspects of the present application.

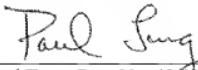
Applicant submits that the cited art (including Sugimoto), even when considered along with common sense and common knowledge to one skilled in the art, does *NOT* render unpatentable said aforementioned aspects of the present application, and that therefore independent claims 1, 7, 8, 14 and 15, and the claims depending therefrom, are allowable over the cited art.

In view of the remarks hereinabove, applicant submits that the application is now allowable, and earnestly solicits the allowance of the application.

If the Examiner can suggest an amendment that would advance this application to condition for allowance, the Examiner is respectfully requested to call the undersigned attorney.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any required fees in connection with this amendment, and to credit any overpayment, to our Deposit Account No. 03-3125.

Respectfully submitted,



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Paul Teng, Reg. No. 40837

Attorney for Applicant

COOPER & DUNHAM LLP  
30 Rockefeller Plaza, 20<sup>th</sup> Floor  
New York, New York 10112  
Tel.: (212) 278-0400